ABSTRACT

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The micro-world, largely hidden from sight, is alluring, beautiful and potentially dangerous. The dynamic arc of life in this turbulent imperceptible world is quick and furious. In my artwork, I use simple living organisms. Because of their microscopic sizes, we don't commonly notice them and therefore they represent largely an unseen world.

Microscopic forms are evidence of processes while simultaneously generating aesthetic outcomes. The diminutive life forms harmonize to create a colorful array of actions, counter-actions and conflicts where they are metaphors for various human conditions. In my work, the living entities are interactive elements and recreate observable conflicts. They compete for resources, dominate a particular area, live in harmony or become invasive and endanger others.

These biological interactions and the aesthetic outcome they yield are the basis of my research. In an artificially constructed living platform, I am the impresario and my players are hostile fragile microorganisms.

INTERACT AND TRANSFORM

By

Selin Balci

Thesis submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
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Advisory Committee:
Associate Professor Dawn Gavin, Chair
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Associate Professor Justin Strom

Acknowledgements

Pursuing a MFA degree is enjoyable and also painful. It feels like it is a long rough trail with lots of hills accompanied with confusion, hardship, bitterness, encouragement, support and help. When I look down to hill now, it feels like my three-year hike passed very quickly but I had lots of experiences that made me more steady, patient and strong.

Of course, there are people behind this MFA thesis. This thesis would not have been possible without the support of many.

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Lastly, I would like to thank my family who believed that I would also be successful in art and supported me from across the ocean.

Selin Balci

College Park, 2012

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Chapter 1. Introduction

My microbiology background influences my artwork. My previous studies in research laboratories focused on pathogen biology. We asked questions such as to how they exist, interact with each other and impact our environment. I apply the same acute scientific laboratory practice in order to create my artwork. I research simple living organisms in a laboratory environment and record the manners in which the microbes interact with one another in a Petri dish, as well as the colors and aesthetics those interactions produce.

The micro-world, largely hidden from sight, is alluring, beautiful and potentially dangerous. The dynamic arc of life in this turbulent imperceptible world is quick and furious. In my artwork, I use living organisms as media. They are evidence of processes of growth and manipulation while simultaneously generating aesthetic outcomes. These entities are mainly different types of fungi. Fungi utilized in my work are microscopic in size and thus not visible to the naked eye. They can be cultured using specific growth media in which the spores will germinate and eventually form a colony. Fungi and Mold can grow in any environment there are sufficient nutrients, warmth and humidity. Depending on the species, fungi can be red, pink, purple, orange, white, black, yellow, green, brown, and gray. Each have a different growth patterns such as tree-ring patterns, circular patterns, etc.

While many airborne fungi are commonly found in most environments, some are more specific to a given environment or substrate. I utilized different microbes in my work, cultured from soil, air or the human body, depending on the subject I am investigating in a given outcome.

My work could be classified as bio art; a new direction in contemporary art that manipulates

the process of life. According to Eduardo Kac, a prominent artist in this area, bio art has to employ one or more of the following approaches. '(1) The coaching of bio-materials into specific inert shapes or behaviors; (2) the unusual or subversive use of biotech tools and processes; (3) the invention or transformation of living organisms with or without social or environmental integration [1]. Bio art uses living organisms and process of life. Kac adds, "bio art must be clearly distinguished from art that exclusively uses traditional or digital media to address biological themes, as in a painting or sculptural depicting a chromosome or a digital photograph suggesting cloned children". In this sense, my work falls into the broader umbrella of 'bio art'.

Chapter 2. Simple Living Organisms in My Work

Simple living organisms become an art material in my work. Microorganisms express their own characteristics with colors and forms. Similar to all other living entities, their existence is the consequence of various interactions. The fungal microorganisms in my work are the performers within an artificially created living-platform where conflicts are played out.

Because of their microscopic size, we don't commonly notice them and therefore they represent largely an unseen world. Growth media, a food source made of potato is used as a base to create a living platform for the microbes I grow. In other words, I create a 'world' for them and then let them live with their own rules.

When they are cultured in growth media they appear in different colors, because of the pigments in their body and secretion of compounds that change the color of the growth media. Hence, they become visible. The growth media, potato dextrose agar (PDA) is the

1 Kac, Eduardo. The signs of Life. Bio-art. P.18

most widely used growth media to grow fungi and bacteria[2]. Because only a certain amount used, it also represents a limitation for the organism that grows and feeds on it. Limited food resources force them to compete and potentially dominate a particular area. As such, they are metaphors for the human predicament to negotiate for finite resources: they compete for resources, dominate a particular area, become invasive and endanger others.

"*Conflicts occur in all aspects of life, even genes compete for expression. Human conflicts tend to follow archetypal themes. Like other animals we battle over resources and access to resources, power and status, and sexual opportunities."* [3]

The types of struggle that occur between humans, interestingly, find equivalence in the microbial world. The diminutive life forms harmonize to create a colorful array of actions, counter-actions where they create territories, boundaries and end up with conflicts. According to recent studies in the evolution of social behavior in microorganism, simple living organisms demonstrate all of the hallmarks of a complex and coordinated social life. They have the capacity to communicate and cooperate to perform a wide range of behaviors. Ecologists and evolutionary biologist who work with macroscopic creatures find the micro world a very unusual place. Many recent discoveries in micro ecology and evolution showed that micro world would be strangely familiar to macro world.[4] In turn, I have chosen to exploit their behavior and life form to provide a unique tool to be incorporated into art works.

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2 BAM Media M127: Potato Dextrose Agar." FDA, U.S. Food and Drug. Administration. Web. April 25, 2012.
3 Gilbert, Paul. International Negotiations, Evolution, and the Value of Compassion. Page 15-26.
4 Crespi, B.J. "The Evolution of Social Behavior in Microorganisms." Trends in Ecology and Evolution. Vol.16 No.4 April 2001.

It represents a relatively new field within contemporary art and has enormous potential for new discoveries.

I observe and participate in interactions and relations between people, societies and countries. Different opinions, ideologies and approaches coexist, and I seek to explore how these interactions and relations transform us, affect who we are and consequently shape the world around us. While I don't make direct references to these dynamics, it does inform my point of view and provides context to my work.

In the artificial living platform (PDA) microorganisms demonstrate some basic biological behaviors such as competing for food, dominating an area and creating borderlines and territories. Interestingly, when different fungi are introduced to the same environment using the same conditions, previously observed borders disappear and completely different ones form. This purely biological process, in an essence, underlies the insignificance and artificiality of the 'man-made' borders and challenges geographical paradigm. It erases the current borders we created and devalues strict country borders. In other words, with my work, I point out to the meaningless of man-made borders. I leave out the human 'mind' and simplify us to an organismal scale with the desire to eliminate and strip out any restrictions dictated by human ideologies.

My research into how artists used microbes in their artwork, took me to Alexander Fleming's research on penicillin in 1930s, one of the most important advances in medical history. Fleming was also using living organisms in his paintings. Fleming painted houses, soldiers, human figures, and other scenes using bacteria. He produced these paintings by using living microbes and growing them with different natural pigments in the places where he wanted various colors. He was using Petri dishes with agar; a nutrient media and he drew the figures

by using a lab tool called a 'loop'. These figures existed only till the microbes grew fully and disturbed the other shapes and forms. After reading how he used the growth of microorganisms on paper, I started to experiment the same method in my practice. I used squared Petri dishes and placed a paper on the surface of a nutrient agar media. After the selected fungi were placed on the paper surface it had had enough food material to grow on it because fungal bodies diffused into the nutrient media underneath. After the desired growth is achieved the paper is removed from the media surface. The paper is afterwards dried, and fixed. However, the limitations of the paper sizes I could use made me think further and I came along with a new technique where I used large size boards and grow the microbes on top of them (Contamination; see Chapter 3.1).

Other artists that used living organisms have used molds, worms, insects and mammals. They mainly have adopted the tools, research findings and process of contemporary biological researches[5].

In his series of "Specimen of Secrecy about Marvelous Discoveries", bio-artist Eduardo Kac created living pieces that change during the exhibition in response to internal metabolism and environmental conditions. Calling them as 'biotopes' he expanded his studies on ecological and evolutionary issues, where he previously explored in transgenic works such as 'The Eighth Day' (2001)[6]. My work differs conceptually and materially. I address not only the ecological issues, but I also observe and examine the social happenings and problems around the world. In addition, the microbes I use are mostly isolated from the soil and air in the area I live. My end product is visually related to satellite images.

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[5] Wilson, Stephen. Art-Science. Living Systems. P.40

6 Eduardo Kac, Specimen of Secrecy about Marvelous Discoveries. 2007. Exhibition catalogue. Web. April 25, 2012.

Even though not a bio artist, I find Bosco Sodi's work very similar to mine. He uses non-artificial organic materials and mixes sawdust, wood pulp, and natural fibers with unadulterated pigments, glue, and water on the horizontally positioned canvas. The paintings are produced through organic and unpredictable changes in the material and are physically involved. Then the artist applies pigments into the material to give vibrant energy and creates abstracted, naturally occurring work. In one of his interviews, he says his work involves chance, which is mainly what happens in most of my work due to contaminants.

Daro Montag is another artist who uses microorganisms in his work. In his practice, he buries color films for a month near his home. The microorganisms in the soil eat the gelatin and leave unique patterns of color on the film. Montag says his initial aim is 'making physical that which is there but not seen'[7]. While making these organisms visible, by using color and form choices expressed by the microbes themselves, different than Montag, I create different visual references that can relate to both natural and human impacted landscapes. I also attempt to construct real interactions and conflicts by utilizing different microorganisms with different characteristics and refer to human conditions.

[7] Wilson, Stephen. Art and Science. Living Systems. P.44

Chapter 3. Projects produced using microbes

3.1. *Contamination*

In Contamination Series (Figure 1), I worked with highly patterned and colored microscopic creatures.

Figure 1. *20 I*, microbial growth on boards, 2012

They coalesce from the intended microenvironment and they are assembled and dissolved into a macro environment. The scale shifts between micro and macro. Once assembled the work can be interpreted as a landscape on a large scale.

I began each panel with an initial plan in a sterile laboratory condition. While they are growing in their enriched environment, by chance and randomly, spores in the air are added to the picture. These spores are mostly referred to as molds or contaminants because they are not desired and come in existence. With this addition, I nourish the landscape of each panel and introduce diverse, vibrant and exciting forms into this sterile and blank initial foundation. While unwanted in sterile lab conditions, contaminants are repeatedly used in my work to create struggles and resistance until they find a final form and become a part of the larger picture. In some cases, they highlight the underlying foundation; in others they become more established. Each panel holds the tension of disunity as forms appear and merge into another, and as various elements multiply and expand like dangerous growths. They intersperse the sterile and controlled environment with chaos and a chance procedure (Figure 2-3).

Figure 2-3. *20 II*, microbial growth on board, 12'x12', 2012

The nature of the biological interactions and transformations that occur in my work evolves from the circumstances in which it was made, including some spontaneous and unexpected activities.

The ‘bounds’ that occur on the surface generate a tension throughout the panels. The panels are voluminously detailed with natural colors expressed by the microbes and their enriched textures, lines, colors and forms. At the first look, forms and shapes look as created spontaneously without any preliminary exam. As I began these panels through experimentation, I sought to find the right microorganism that would create the boundaries when placed in a same artificial environment. I usually match brilliant colors with darker colors to give a strong visual contrast. In addition to color, the placement of the growth provides a tension (Figure 4-5). Sometimes, they are mutually attached, dependent, barely touching or estranged.

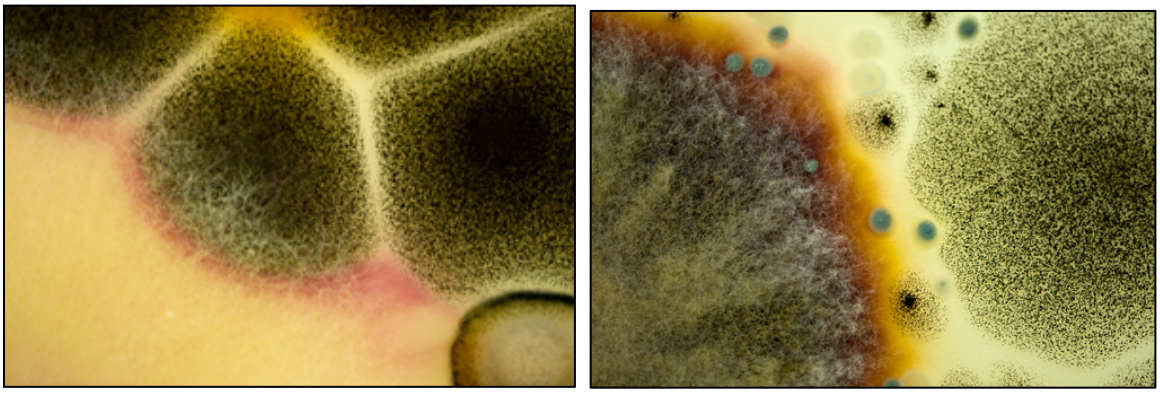

Figure 4-5. *16 1*, microbial growth on board, 11’x14’’, 2012

After few days, in order to add natural elements, I exposed them to the spores that naturally occur in the air, herein referred to contaminants. I knew that with a few microorganisms initially placed only the same combinations could be created. But with contaminants, which occur in unknown amounts, they can create various shapes and interactions that would not be the same on each board. The contamination is roguish, random, less inclined to control or behaves according to expectations. For this reason it is dynamic and compelling visually.

Conceptually, I wanted to create unexpected physical and visual interactions and conflicts with an emphasis on the transformation that occurs. When the unexpected happens, the microbes struggle with each other and as an outcome they grow differently and produce different lines to protect their territories. The surface is laced with graceful, brilliant colors or violent ones create the darkness until the entire surface is covered and patterned with borders. In the best compositions, these lines are bothered with frantic forms of contamination, which happens spontaneously, and chance operated. All the interactions are also influenced by other factors such as temperature, light, humidity and evaporation that might have an effect on the biology of microbes present.

My work is also inspired by aerial views of the land (Figure 4-5). I am fascinated by the landscape viewed during a flight, looking out from an altitude of some thousands of feet.

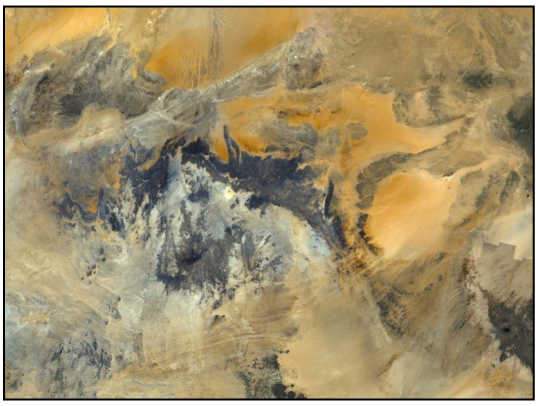

Figure 6.
Satellite view from Google Maps

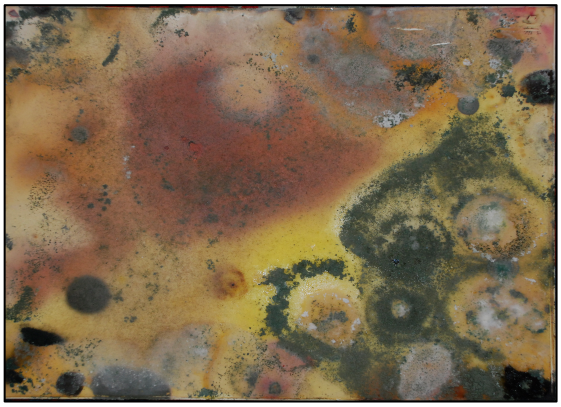

Figure 7.
22 I, Microbial growth on board,
16’’x20’’, 2012

The landscape form from that altitude looks minimal and so simple and organic. The peaks and hills rise and fall. This topography gives the earth’s surface a diverse quality. When I look at fractures and shapes of microorganisms create in my work, I see these same

transitions on their surfaces created by their own interactions and their own natural formations (Figure 6-7).

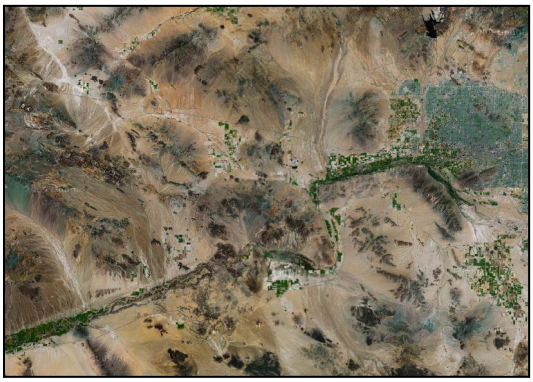

Figure 8.
Satellite view from Google Maps

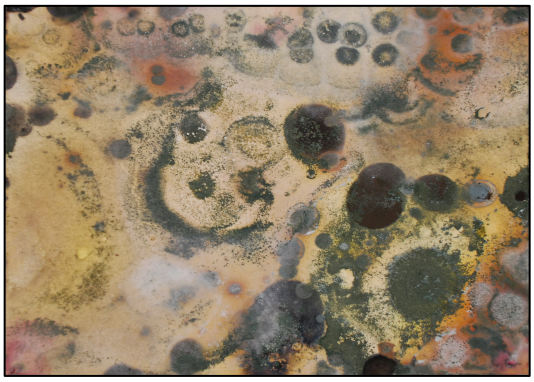

Figure 9.
22 I, Microbial growth on board, 16''x20'', 2012

The forms I create parallel the visual impact of humans' activity on the landscape (figure 8-9), which creates physical borderlines that separate countries and damage our natural environment.

Figure 10. *Contamination (*Installation view*)*, microbial growth on boards, 2012.

Figure 11 *Contamination (*Installation view), microbial growth on boards, 2012.

3.2. Structures

In *Structures*, the surface of each panel is heavily textured and shows great number of vigorous contrasts. The horizontal and vertical movements improvised with unexpected organic shapes. While different colored curved forms meet edge to edge and create a visual fissure, it is apparent that there is also a certain foundation and pattern in each panel emerging and receding with natural elements. *Structures* explores the process of how organisms interact with each other and how conflicts emerge. The raised forms on the surface created organic or skin like thicknesses and textures. The assemblage, colors and smallness of the panels makes the overall look similar to internal organs or body parts (Figure 12).

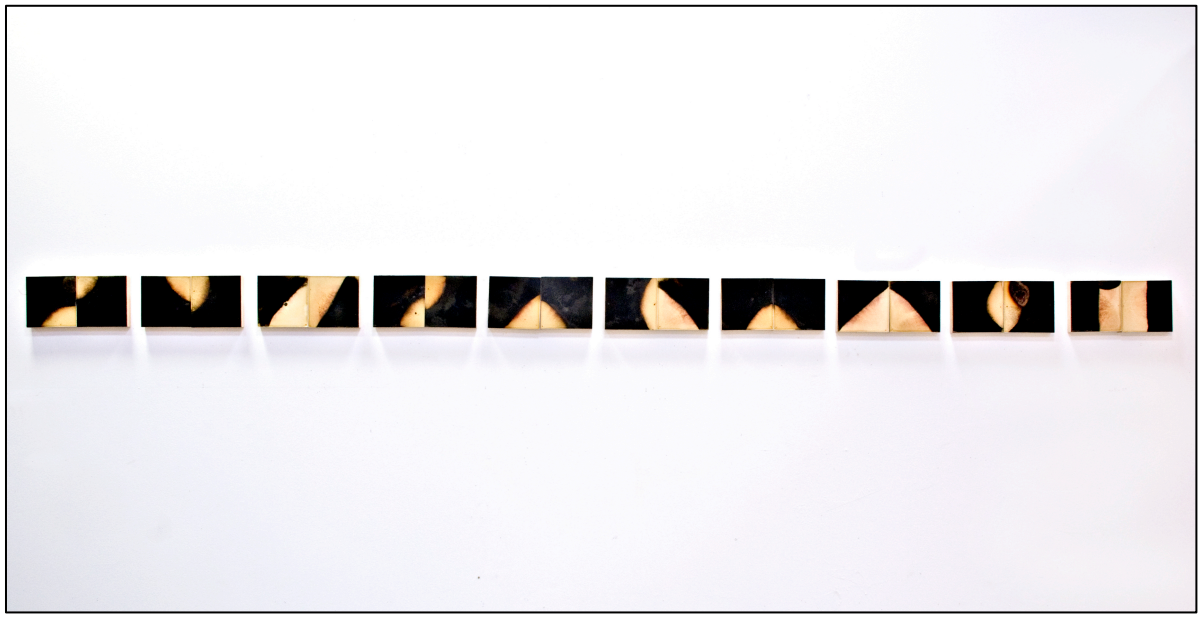

Figure 12. *Structures*, microbial growth on boards, 5’’x10’’, 2011

3.3. The World

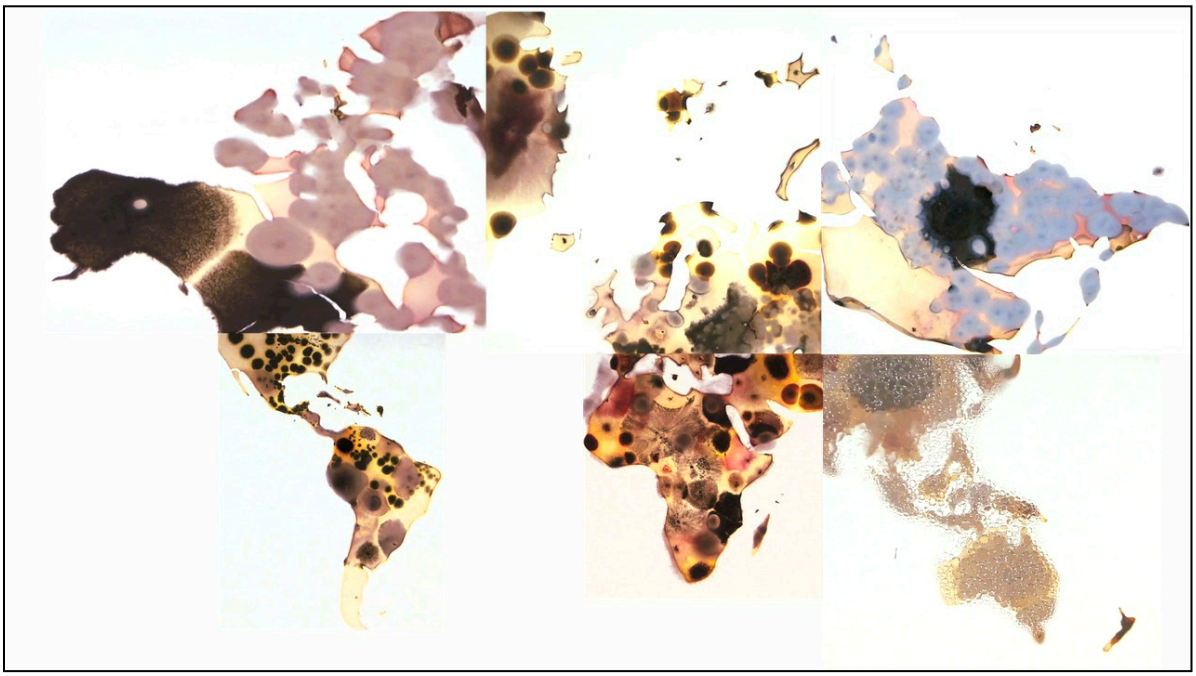

Figure 13. The World, Video, 4:44 min, 2010

In '*The World'*, I decided to use microorganisms to specifically refer to human behavior, culture and society. I re-created the world political map on a Petri dish with growth media. After tracing each continent on a Petri dish, excessive areas of agar was removed to make the continents, and then different microorganisms were placed for to represent each country. Growths of microorganisms depend on food sources, the environment such as light, temperature and humidity and their ability to compete with others. Based on inherent characteristics and the environmental conditions some microorganisms are more dominant and others less successful invaders. I chose more aggressive microbes for the developed countries to reflect the current political characteristics. Developing countries have been

represented by less aggressive/fast growing ones. These aggressive and less aggressive living forms are representing individual or groups of people who caught in violent conflicts, social/political forces, global economies, markets and their relation to power and control.

On the map, aggressive microbes grow faster and have larger territories, leaving smaller space to be colonized by others. It also results in less resources/food being available for slow growers. Contamination also does occur on some parts of the map, which in a way reflects immigration or migration. After the microbes create their territories based on the complex dynamics, and consume their entire environment, they will start to die because of the absence of the food and water resources in growth media. This represents the natural resources available.

The entire work demonstrates human actions, form of power, political pressures, immigration, racialism and the dominance of superior countries. In addition to the political facts reflected by the interaction, the work also demonstrates how dependent we are on natural resources. The global threats posed by climate change and declining natural resources-consequences of human activity are displayed. The outcome, as seen in a short time-period in a 'Petri dish environment' can lead to rapid exhaustion and an un-sustainable future.

In this work, I consider our relationship to the natural world and suggest ideas about existence, harmony, connection and dependence to one another. It also forces the viewer think of population growth projections for the globe and it's impact on natural resources.

3.4. Evolving Works

The evolving project included *Bound by rules of Life*, *Artifact* and *Our Mutual Environment*. The contents change during the exhibition time. Colors, shape and forms were depended on the microorganisms' characteristics but at the same time strongly influenced by environment; humidity, temperature and air flow at the gallery space.

3.4.1. Bound by rules of Life

After choosing the organisms with different colors and characteristics I observed how those microbes react to each other in a Petri dish environment. After a careful initial experiment, I placed them in the acrylic containers and let them live by their own rules. The overall view changed during the exhibition time, and created unique combinations and scenes for each day. The contents were very sensitive and were transformed because of the airflow, light and the temperature. Also, some of the aerial contaminants of the space disturbed the initial organisms growth and created different shapes. All of these 'expected' and 'unexpected' changes affected the work (Figure 14).

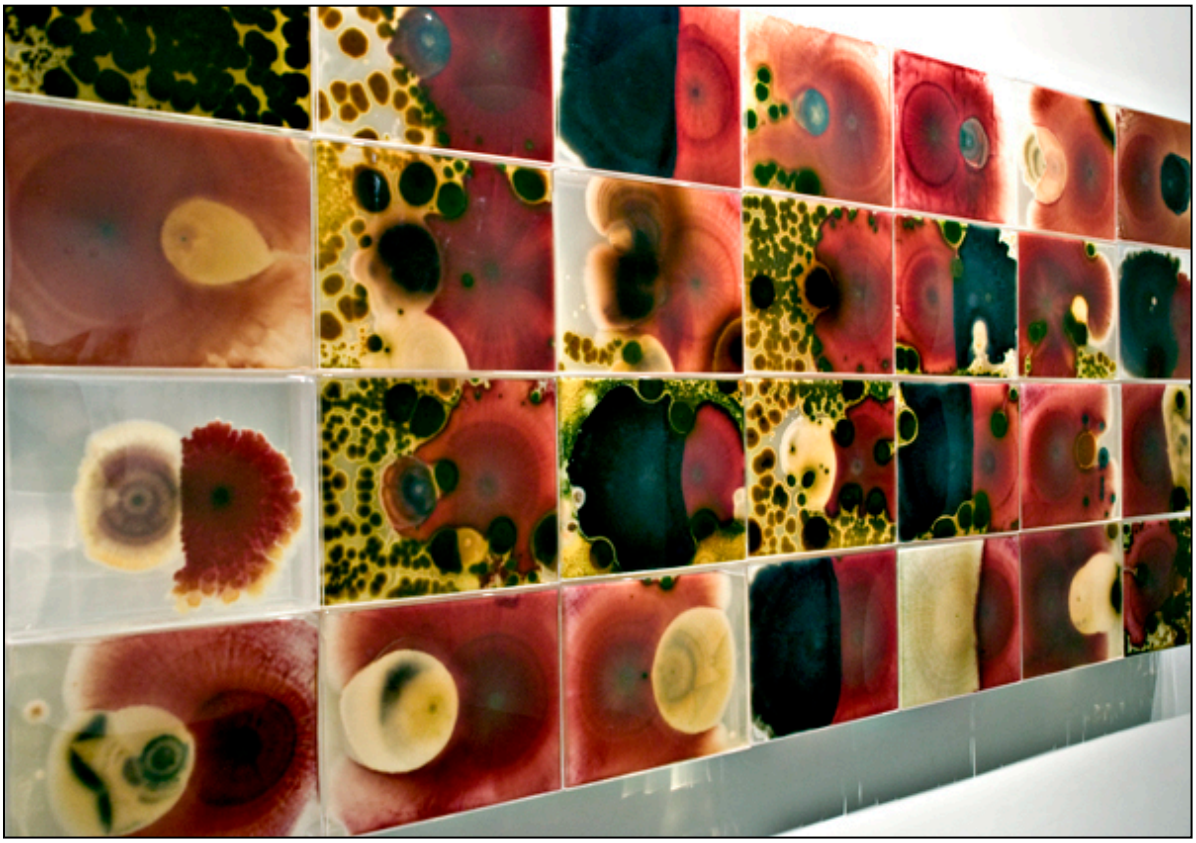

Figure 14. *Bound by Rules of Life*, Evolving microbial growth, 35''x75'', 2011

3.4.2. Artifact

In considering constructing a space within the gallery, to interact with the audience and create awareness on migration, I created *Artifact*. I formed an artificial world in a glass container. A single culture was placed in Africa to represent human origin and its migration from Africa to the rest of the world. After its installation, the fungal culture grew slowly and expands its range to take over the artificial world that I created. At the end, the fungus- the humans- dominated the world as a single organism. Increasing its size by projecting my mutating world overhead, I offer viewers a visceral encounter with the process.

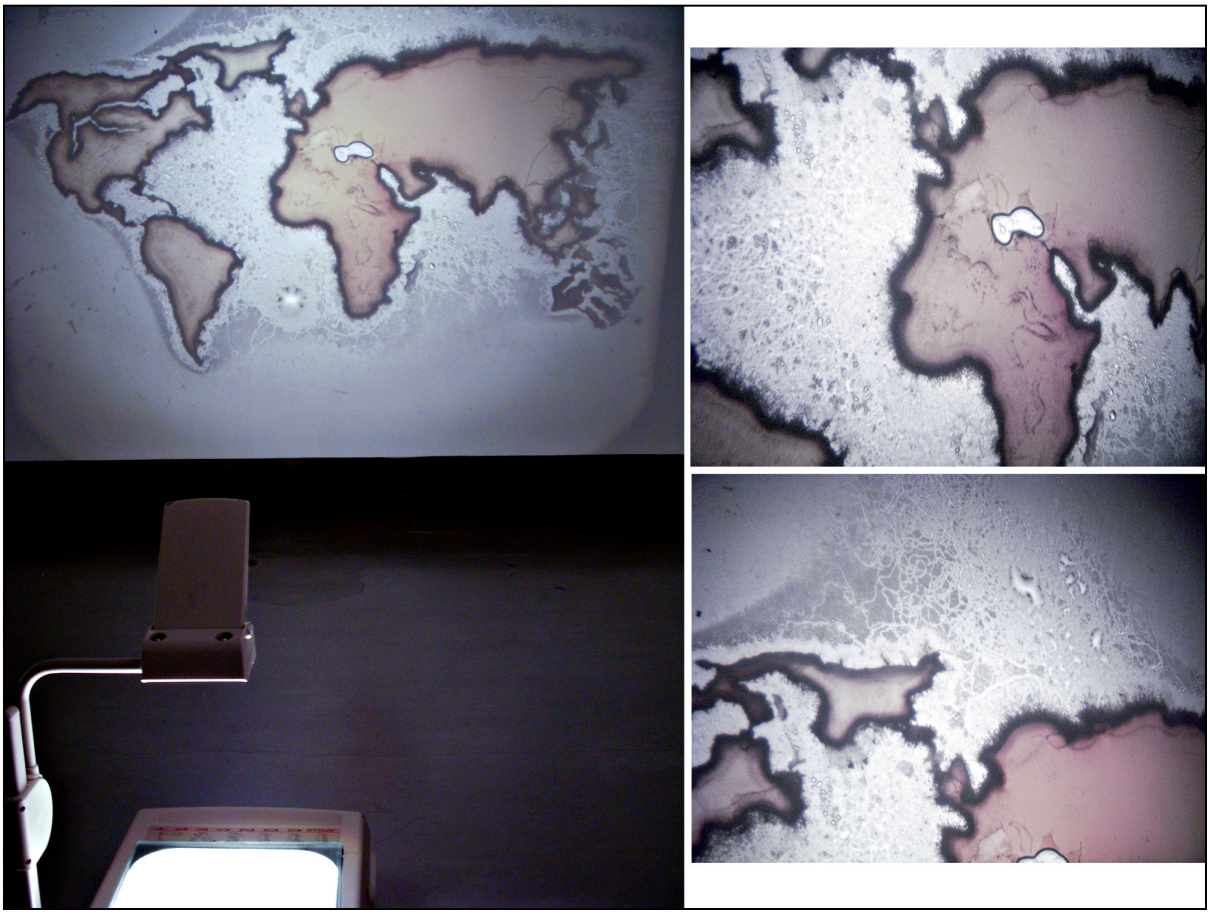

Figure 15 *Artifact*, microbial growth on glass, over-head projector, 2011.

3.4.3. Our Mutual Environment

In my work, while touching upon social issues, I also have been thinking about how I could translate my untraditional media to create a more challenging space and let the audience participate. In this work participants contributed in my gallery opening night. Small samples were taken from ninety gallery hosts' body and placed in an agar plate. My initial aim was to create portraits of them by using an untraditional process. Participants contributed hair, nail and small skin slices, fabric from their clothing and little pieces from their pockets. The participants labeled the Petri dishes with their names, sample names and the date; a scientific

method to label the Petri dishes in a laboratory. After few days, the microorganisms that shared the mutual environment with the participant- started to pattern (Figure 16). It became very apparent after a week, as the color of the media changed due to the pigments in their body.

Figure 16. *Our Mutual Environment*, Evolving microbial growth, Petri dishes, organic material taken from gallery hosts, 2010

Chapter 4. Conclusion

I find behaviors of simple living organisms' very close to human actions and motives. In an artificially constructed world, these themes can be recreated and directed to showcase a biological entity.

My concepts were explored using living entities to recreate observable interactions and conflicts across the picture surface, where the outcomes reveal boundaries, edges and distinctive forms. I assemble these forms and shapes to create various visual references that can relate to both natural and human impacted landscapes.

Despite their extremely fragile nature it was possible to give a glimpse on their existence and interaction. Nevertheless, all organisms on earth evolve on similar principles. From a pure biological view, survival, resilience and most importantly, passing genes to next generation are fundamental for all living organisms. From a social perspective more can be said. This is where my art comes into perspective.

With my work, I referenced these basic underlying social principles and projected these in an effort to highlight social issues. Interactions of humans compared to other less evolved organisms share many similarities. The use of microbial organisms in art media remains largely untouched. Microbes certainly present a wealth of opportunities for me to continue my practice. As shown in this thesis project, multiple techniques have been developed or adapted that provides for further establishment of this media.

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